

類 科：醫務管理

科 目：生物統計學與流行病學

考試時間：2小時

座號：\_\_\_\_\_

※注意：(一)可以使用電子計算器，須詳列解答過程。

(二)不必抄題，作答時請將試題題號及答案依照順序寫在試卷上，於本試題上作答者，不予計分。

- 一、某醫療機構執行健康促進計畫，針對自願參加者進行減重介入，分三種介入方式：跳繩、慢走、飲食改善。結果如下表：

	跳繩	慢走	飲食改善
樣本數	45	31	38
體重下降平均值(公斤)	8	11	14
體重下降標準差(公斤)	3	3	2

(一)請問三種介入活動是否對體重下降有顯著差異，請檢定之。(15分)

(二)以Scheffe'事後檢定方法，比較飲食改善與跳繩兩組之減重效果是否有統計顯著差異？(查表值取最接近者)(10分)

- 二、某健康促進業務主管想了解體重( $X$ ; 公斤)與血清總膽固醇( $Y$ ; mg/dL)之相關，以利未來規劃介入活動之參考，今隨機選取自願受測者10名，得到以下資料(已知 $\sum X_i^2 = 38573$ ;  $\sum Y_i^2 = 344693$ ;  $\sum X_i Y_i = 114996$ )：

受測者	1	2	3	4	5	6	7	8	9	10
體重	69	52	73	49	75	61	46	54	78	54
血清總膽固醇	200	177	196	155	212	201	150	165	222	163

(一)請計算其相關係數( $r$ )。(10分)(二)計算相關係數( $r$ )之95%信賴區間。(5分)

(三)求最小平方線性迴歸方程式。(5分)

(四)若有一位體重70公斤的受測者，則該受測者之血清總膽固醇預測值及95%信賴區間為何？(5分)

- 三、請依多重因子之致病機制因果判斷準則(Hill's Rule)來說明某污染源(如：化工廠運轉)與周邊居民健康效應(如：癌症發生率)之因果關係推論，應考慮那些要素？(20分)

(請接第二頁)

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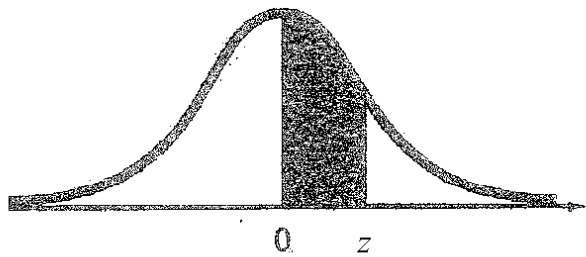
四、研究發現苯（Benzene）暴露可能造成白血病（Leukemia），下列為某研究針對職業暴露團體進行之追蹤調查結果：

	觀察人年	白血病確診案例
苯暴露勞工	2387	18
<10 年	1862	10
$\geq 10$ 年	525	8
非苯暴露勞工	5450	12

- (一) 苯暴露與白血病發生之相對危險性（以 Incidence Density Ratio 來表達）為多少？請進行統計顯著性檢定。（15 分）
- (二) 依苯暴露時間分為非苯暴露、<10 年暴露、 $\geq 10$  年暴露三組，請依上表數值，進行劑量效應反應關係推論。（15 分）

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TABLE IV Normal Curve Areas



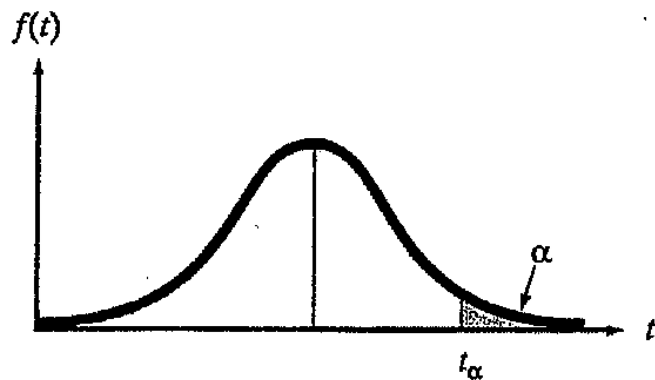
z	.00	.01	.02	.03	.04	.05	.06	.07	.08	.09
.0	.0000	.0040	.0080	.0120	.0160	.0199	.0239	.0279	.0319	.0359
.1	.0398	.0438	.0478	.0517	.0557	.0596	.0636	.0675	.0714	.0753
.2	.0793	.0832	.0871	.0910	.0948	.0987	.1026	.1064	.1103	.1141
.3	.1179	.1217	.1255	.1293	.1331	.1368	.1406	.1443	.1480	.1517
.4	.1554	.1591	.1628	.1664	.1700	.1736	.1772	.1808	.1844	.1879
.5	.1915	.1950	.1985	.2019	.2054	.2088	.2123	.2157	.2190	.2224
.6	.2257	.2291	.2324	.2357	.2389	.2422	.2454	.2486	.2517	.2549
.7	.2580	.2611	.2642	.2673	.2704	.2734	.2764	.2794	.2823	.2852
.8	.2881	.2910	.2939	.2967	.2995	.3023	.3051	.3078	.3106	.3133
.9	.3159	.3186	.3212	.3238	.3264	.3289	.3315	.3340	.3365	.3389
1.0	.3413	.3438	.3461	.3485	.3508	.3531	.3554	.3577	.3599	.3621
1.1	.3643	.3665	.3686	.3708	.3729	.3749	.3770	.3790	.3810	.3830
1.2	.3849	.3869	.3888	.3907	.3925	.3944	.3962	.3980	.3997	.4015
1.3	.4032	.4049	.4066	.4082	.4099	.4115	.4131	.4147	.4162	.4177
1.4	.4192	.4207	.4222	.4236	.4251	.4265	.4279	.4292	.4306	.4319
1.5	.4332	.4345	.4357	.4370	.4382	.4394	.4406	.4418	.4429	.4441
1.6	.4452	.4463	.4474	.4484	.4495	.4505	.4515	.4525	.4535	.4545
1.7	.4554	.4564	.4573	.4582	.4591	.4599	.4608	.4616	.4625	.4633
1.8	.4641	.4649	.4656	.4664	.4671	.4678	.4686	.4693	.4699	.4706
1.9	.4713	.4719	.4726	.4732	.4738	.4744	.4750	.4756	.4761	.4767
2.0	.4772	.4778	.4783	.4788	.4793	.4798	.4803	.4808	.4812	.4817
2.1	.4821	.4826	.4830	.4834	.4838	.4842	.4846	.4850	.4854	.4857
2.2	.4861	.4864	.4868	.4871	.4875	.4878	.4881	.4884	.4887	.4890
2.3	.4893	.4896	.4898	.4901	.4904	.4906	.4909	.4911	.4913	.4916
2.4	.4918	.4920	.4922	.4925	.4927	.4929	.4931	.4932	.4934	.4936
2.5	.4938	.4940	.4941	.4943	.4945	.4946	.4948	.4949	.4951	.4952
2.6	.4953	.4955	.4956	.4957	.4959	.4960	.4961	.4962	.4963	.4964
2.7	.4965	.4966	.4967	.4968	.4969	.4970	.4971	.4972	.4973	.4974
2.8	.4974	.4975	.4976	.4977	.4977	.4978	.4979	.4979	.4980	.4981
2.9	.4981	.4982	.4982	.4983	.4984	.4984	.4985	.4985	.4986	.4986
3.0	.4987	.4987	.4987	.4988	.4988	.4989	.4989	.4989	.4990	.4990

Source: Abridged from Table I of A. Hald, *Statistical Tables and Formulas* (New York: Wiley), 1952. Reproduced by permission of A. Hald.

(請接第四頁)

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**TABLE VI Critical Values of t**



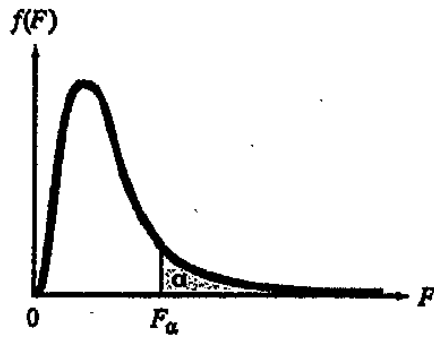
$\nu$	$t_{.100}$	$t_{.050}$	$t_{.025}$	$t_{.010}$	$t_{.005}$	$t_{.001}$	$t_{.0005}$
1	3.078	6.314	12.706	31.821	63.657	318.31	636.62
2	1.886	2.920	4.303	6.965	9.925	22.326	31.598
3	1.638	2.353	3.182	4.541	5.841	10.213	12.924
4	1.533	2.132	2.776	3.747	4.604	7.173	8.610
5	1.476	2.015	2.571	3.365	4.032	5.893	6.869
6	1.440	1.943	2.447	3.143	3.707	5.208	5.959
7	1.415	1.895	2.365	2.998	3.499	4.785	5.408
8	1.397	1.860	2.306	2.896	3.355	4.501	5.041
9	1.383	1.833	2.262	2.821	3.250	4.297	4.781
10	1.372	1.812	2.228	2.764	3.169	4.144	4.587
11	1.363	1.796	2.201	2.718	3.106	4.025	4.437
12	1.356	1.782	2.179	2.681	3.055	3.930	4.318
13	1.350	1.771	2.160	2.650	3.012	3.852	4.221
14	1.345	1.761	2.145	2.624	2.977	3.787	4.140
15	1.341	1.753	2.131	2.602	2.947	3.733	4.073
16	1.337	1.746	2.120	2.583	2.921	3.686	4.015
17	1.333	1.740	2.110	2.567	2.898	3.646	3.965
18	1.330	1.734	2.101	2.552	2.878	3.610	3.922
19	1.328	1.729	2.093	2.539	2.861	3.579	3.883
20	1.325	1.725	2.086	2.528	2.845	3.552	3.850
21	1.323	1.721	2.080	2.518	2.831	3.527	3.819
22	1.321	1.717	2.074	2.508	2.819	3.505	3.792
23	1.319	1.714	2.069	2.500	2.807	3.485	3.767
24	1.318	1.711	2.064	2.492	2.797	3.467	3.745
25	1.316	1.708	2.060	2.485	2.787	3.450	3.725
26	1.315	1.706	2.056	2.479	2.779	3.435	3.707
27	1.314	1.703	2.052	2.473	2.771	3.421	3.690
28	1.313	1.701	2.048	2.467	2.763	3.408	3.674
29	1.311	1.699	2.045	2.462	2.756	3.396	3.659
30	1.310	1.697	2.042	2.457	2.750	3.385	3.646
40	1.303	1.684	2.021	2.423	2.704	3.307	3.551
60	1.296	1.671	2.000	2.390	2.660	3.232	3.460
120	1.289	1.658	1.980	2.358	2.617	3.160	3.373
$\infty$	1.282	1.645	1.960	2.326	2.576	3.090	3.291

Source: This table is reproduced with the kind permission of the Trustees of Biometrika from E. S. Pearson and H. O. Hartley (eds.), *The Biometrika Tables for Statisticians*, Vol. 1, 3d ed., Biometrika, 1966.

(請接第五頁)

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TABLE VIII Percentage Points of the  $F$ -distribution,  $\alpha = .05$



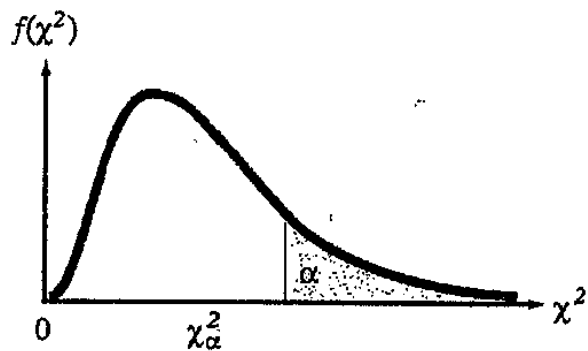
$\nu_1 \backslash \nu_2$		NUMERATOR DEGREES OF FREEDOM								
		1	2	3	4	5	6	7	8	9
DENOMINATOR DEGREES OF FREEDOM	1	161.4	199.5	215.7	224.6	230.2	234.0	236.8	238.9	240.5
	2	18.51	19.00	19.16	19.25	19.30	19.33	19.35	19.37	19.38
	3	10.13	9.55	9.28	9.12	9.01	8.94	8.89	8.85	8.81
	4	7.71	6.94	6.59	6.39	6.26	6.16	6.09	6.04	6.00
	5	6.61	5.79	5.41	5.19	5.05	4.95	4.88	4.82	4.77
	6	5.99	5.14	4.76	4.53	4.39	4.28	4.21	4.15	4.10
	7	5.59	4.74	4.35	4.12	3.97	3.87	3.79	3.73	3.68
	8	5.32	4.46	4.07	3.84	3.69	3.58	3.50	3.44	3.39
	9	5.12	4.26	3.86	3.63	3.48	3.37	3.29	3.23	3.18
	10	4.96	4.10	3.71	3.48	3.33	3.22	3.14	3.07	3.02
	11	4.84	3.98	3.59	3.36	3.20	3.09	3.01	2.95	2.90
	12	4.75	3.89	3.49	3.26	3.11	3.00	2.91	2.85	2.80
	13	4.67	3.81	3.41	3.18	3.03	2.92	2.83	2.77	2.71
	14	4.60	3.74	3.34	3.11	2.96	2.85	2.76	2.70	2.65
	15	4.54	3.68	3.29	3.06	2.90	2.79	2.71	2.64	2.59
	16	4.49	3.63	3.24	3.01	2.85	2.74	2.66	2.59	2.54
	17	4.45	3.59	3.20	2.96	2.81	2.70	2.61	2.55	2.49
	18	4.41	3.55	3.16	2.93	2.77	2.66	2.58	2.51	2.46
	19	4.38	3.52	3.13	2.90	2.74	2.63	2.54	2.48	2.42
	20	4.35	3.49	3.10	2.87	2.71	2.60	2.51	2.45	2.39
	21	4.32	3.47	3.07	2.84	2.68	2.57	2.49	2.42	2.37
	22	4.30	3.44	3.05	2.82	2.66	2.55	2.46	2.40	2.34
	23	4.28	3.42	3.03	2.80	2.64	2.53	2.44	2.37	2.32
	24	4.26	3.40	3.01	2.78	2.62	2.51	2.42	2.36	2.30
	25	4.24	3.39	2.99	2.76	2.60	2.49	2.40	2.34	2.28
	26	4.23	3.37	2.98	2.74	2.59	2.47	2.39	2.32	2.27
	27	4.21	3.35	2.96	2.73	2.57	2.46	2.37	2.31	2.25
	28	4.20	3.34	2.95	2.71	2.56	2.45	2.36	2.29	2.24
	29	4.18	3.33	2.93	2.70	2.55	2.43	2.35	2.28	2.22
	30	4.17	3.32	2.92	2.69	2.53	2.42	2.33	2.27	2.21
40	4.08	3.23	2.84	2.61	2.45	2.34	2.25	2.18	2.12	
60	4.00	3.15	2.76	2.53	2.37	2.25	2.17	2.10	2.04	
120	3.92	3.07	2.68	2.45	2.29	2.17	2.09	2.02	1.96	
$\infty$	3.84	3.00	2.60	2.37	2.21	2.10	2.01	1.94	1.88	

Source: From M. Merrington and C. M. Thompson, "Tables of Percentage Points of the Inverted Beta ( $F$ )-Distribution." *Biometrika*, 1943, 33, 73-88. Reproduced by permission of the *Biometrika* Trustees.

(請接第六頁)

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TABLE XIII Critical Values of  $\chi^2$



$\chi^2_{0.100}$	$\chi^2_{0.050}$	$\chi^2_{0.025}$	$\chi^2_{0.010}$	$\chi^2_{0.005}$	d.f.
2.705541	3.841455	5.023903	6.634891	7.879400	1
4.605176	5.991476	7.377779	9.210351	10.5965	2
6.251394	7.814725	9.348404	11.3449	12.8381	3
7.779434	9.487728	11.1433	13.2767	14.8602	4
9.236349	11.0705	12.8325	15.0863	16.7496	5
10.6446	12.5916	14.4494	16.8119	18.5475	6
12.0170	14.0671	16.0128	18.4753	20.2777	7
13.3616	15.5073	17.5345	20.0902	21.9549	8
14.6837	16.9190	19.0228	21.6660	23.5893	9
15.9872	18.3070	20.4832	23.2093	25.1881	10
17.2750	19.6752	21.9200	24.7250	26.7569	11
18.5493	21.0261	23.3367	26.2170	28.2997	12
19.8119	22.3620	24.7356	27.6882	29.8193	13
21.0641	23.6848	26.1189	29.1412	31.3194	14
22.3071	24.9958	27.4884	30.5780	32.8015	15
23.5418	26.2962	28.8453	31.9999	34.2671	16
24.7690	27.5871	30.1910	33.4087	35.7184	17
25.9894	28.8693	31.5264	34.8052	37.1564	18
27.2036	30.1435	32.8523	36.1908	38.5821	19
28.4120	31.4104	34.1696	37.5663	39.9969	20
29.6151	32.6706	35.4789	38.9322	41.4009	21
30.8133	33.9245	36.7807	40.2894	42.7957	22
32.0069	35.1725	38.0756	41.6383	44.1814	23
33.1962	36.4150	39.3641	42.9798	45.5584	24
34.3816	37.6525	40.6465	44.3140	46.9280	25
35.5632	38.8851	41.9231	45.6416	48.2898	26
36.7412	40.1133	43.1945	46.9628	49.6450	27
37.9159	41.3372	44.4608	48.2782	50.9936	28
39.0875	42.5569	45.7223	49.5878	52.3355	29
40.2560	43.7730	46.9792	50.8922	53.6719	30
51.8050	55.7585	59.3417	63.6908	66.7660	40
63.1671	67.5048	71.4202	76.1538	79.4898	50
74.3970	79.0820	83.2977	88.3794	91.9518	60
96.5782	101.879	106.629	112.329	116.321	80
118.498	124.342	129.561	135.807	140.170	100